Video Quality Research

Outputs

- Digital video quality measurement technology.
- Journal papers and national/international video quality measurement standards.
- Technical input to development of U.S. policies on advanced video technologies.
- A national objective and subjective digital video quality testing laboratory.

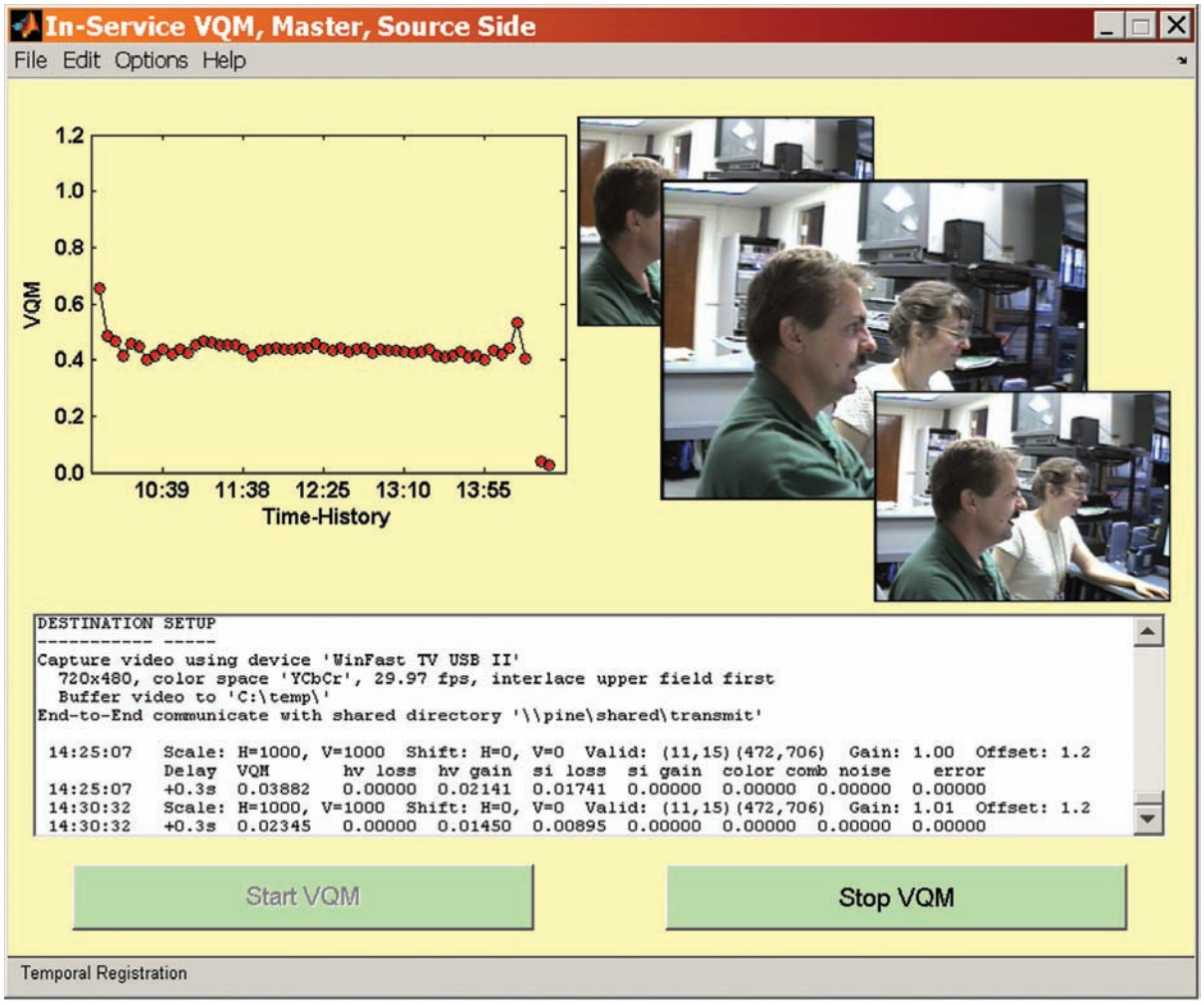
Objective metrics for quantifying the performance of digital video systems (e.g., direct broadcast satellite, digital television, high definition television, video teleconferencing, telemedicine, internet and cell phone video) are required by end-users and service providers for specification of system performance, comparison of competing service offerings, network maintenance, and use optimization of limited network resources. The goal of the ITS Video Quality Research project is to develop the required technology for assessing the performance of these new digital video systems and to actively transfer this technology to other government agencies, end users, standards bodies, and the telecommunications industry, thereby producing increases in quality of service that benefit all end users and service providers.

To be accurate, digital video quality measurements must be based on perceived "picture quality" and must be made in service. This is because the performance of digital video systems is variable and depends upon the dynamic characteristics of both the input video and the digital transmission system. To solve this problem, ITS has continued to develop new measurement paradigms based upon extraction and comparison of low-bandwidth, perception-based features that can be easily communicated across the telecommunications network. These new measurement paradigms (now commonly known throughout the world as "reduced reference" measurements) have received three U.S. patents, been adopted as the North American Standard for measuring digital video quality (ANSI T1.801.03-2003), been included in two International Telecommunication Union Recommendations (ITU-T Recommendation J.144Revised, ITU-R Recommendation BT.1683), and are currently being used by hundreds of individuals and organizations worldwide.

To facilitate the transfer of ITS-developed video quality metrics (VQMs) into the private sector, ITS has developed two software tools. The first tool, called the "Laboratory VQM Tool," is useful for bench testing of video systems. For this tool, video from the source and destination ends of a video system must be present at a single personal computer (PC). Work was completed in FY 2005 to expand the existing VQM software tools to include new end-to-end video quality monitoring capabilities. This new software tool, called the "In-Service VQM (IVQM) Tool," runs on two PCs, one located at the source end and the other located at the destination end. The two PCs communicate their reduced reference features via the Internet. Using these new software tools, users and service providers can quantify the digital video quality of their networks using methods standardized by ANSI and the ITU.

The figure on the next page gives a screen snapshot of the IVQM monitoring screen (master controlling computer at video source). The IVQM monitoring screen contains a menu bar, a time history plot of the selected VQM, three sample frames from the last video capture (first, middle, and last), a text box listing detailed calibration and VQM results, two buttons ("Start VQM" and "Stop VQM"), and a status bar at the bottom of the screen. VQM estimates are reported on a scale from zero to one, where zero means that no impairment is visible and one means that the video clip has reached the maximum impairment level. The capture time of the sequences is displayed on the X-axis. Results and captured video sequences can be saved for later analysis.

During FY 2005, 176 new Cooperative Research and Development Agreements (CRADAs) were implemented with U.S. companies/individuals and 111 new Evaluation License Agreements (EVAs) were implemented with foreign companies/individuals. These CRADAs and EVAs provide companies with an easy mechanism for evaluating ITS video quality measurement technology and software before signing commercial licensing agreements. As a result of this arrangement, a leading provider of telecommunication performance measurement equipment and services signed a commercial licensing agreement with ITS in FY 2005.



Snapshot of IVQM monitoring screen (master controlling computer at video source).

Recent Publications

M.H. Pinson and S. Wolf, "In-service video quality metric (IVQM) user's manual," NTIA Handbook HB-05-424, Apr. 2005.

S. Wolf and M.H. Pinson, "Low bandwidth reduced reference video quality monitoring system," in *Proc. of First International Workshop on Video Processing and Quality Metrics for Consumer Electronics*, Scottsdale, Arizona, Jan. 2005.

M.H. Pinson and S. Wolf, "Video scaling estimation technique," NTIA Technical Memorandum TM-05-417, Jan. 2005.

Further information can be found on the Video Quality Research home page at http://www.its.bldrdoc.gov/n3/video.

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